West Wishkah Bridge
West Wishkah Road Spanning
Wishkah River Middle Fork
Aberdeen Vicinity
Grays Harbor County
Washington

HAER No. WA-22

HAER,
WASH,
14-ABER.V,
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Western Region
Department of Interior
San Francisco, California 94102

HAER
WASH,
14-ABER.V,
1-

HISTORIC AMERICAN ENGINEERING RECORD

WEST WISHKAH BRIDGE HAER NO. WA-22

LOCATION: West Wishkah Road Spanning Wishkah River Middle Fork
Aberdeen Vicinity
Grays Harbor County
Washington

USGS 15 MINUTE HUMPTULIPS, WASHINGTON
UNIVERSAL TRANSVERSE MECATOR (UTM) COORDINATES:
10 440313 5217377

DATE OF CONSTRUCTION: 1915

ENGINEER: F.D. SHEFFIELD

BUILDER: COAST BRIDGE CO., PORTLAND, OREGON

PRESENT OWNER: GRAYS HARBOR COUNTY
P.O. BOX 511
MONTESANO, WASHINGTON 98563

PRESENT USE: VEHICULAR BRIDGE

SIGNIFICANCE: THE WEST WISHKAH RIVER BRIDGE IS THE ONLY REMAINING HIGHWAY BRIDGE OF DOUBLE INTERSECTION WARREN THROUGH TRUSS DESIGN IN THE STATE OF WASHINGTON. IT IS THE WORK OF F. D. SHEFFIELD, A CIVIL ENGINEER FROM SEATTLE, WASHINGTON. THE BRIDGE WAS LISTED IN THE NATIONAL REGISTER OF HISTORIC PLACES IN 1980.

REPORT PREPARED BY: JOHN C.E. SHELDON
ENGINEERING TECHNICIAN
DEPARTMENT OF PUBLIC WORKS
GRAYS HARBOR COUNTY
P.O. BOX 511
MONTESANO, WASHINGTON 98563

DATE: SEPTEMBER 1988

In a secluded section of Grays Harbor County, on the West Wishkah Road, is a historic highway bridge which has spanned the middle fork of the Wishkah River for over 70 years. The West Wishkah Bridge derives its name from the County road it has served since 1915, when it was constructed as a vehicular bridge replacement for a footbridge that crossed the Wishkah River. The bridge was built in response to petitions filed with the County by Polish immigrants who had settled between the west and middle forks of the Wishkah River[1] (see photograph No. 15). This vicinity was called Greenwood after the name of a local timber company that had set up operations in an area of the Wishkah River Valley especially noted for its plentiful stands of lush green forest timber.[2] In 1980, the West Wishkah Bridge itself achieved a measure of recognition when it was placed on the National Register of Historic Places Inventory as the last remaining highway bridge of double intersection Warren through truss design in the State of Washington.

The West Wishkah Bridge was designed by F.D. Sheffield in 1915 - his design plan is dated April 1915 (see photograph No. 16) - in conjunction with two other bridges, and all three truss bridges were constructed in the summer and autumn of that same year by the Coast Bridge Company of Portland, Oregon. An entry in the Grays Harbor County (then called Chehalis County) Commissioner's Journal made on the 24th of May, 1915, records the following:

> Bids were opened at 1:30 p.m. for the construction of the three highway bridges in Township 19 N., Range 9 W., W.M., over the Wishkah River, and upon examination and consideration of the same, it was found that the Coast Bridge Co., of Portland, Oregon, was the best bid, and the contract was awarded to them, for the sum of $16,488.00.....

The West Wishkah Bridge is estimated to have cost a third of the sum of the contract bid submitted by the Coast Bridge Company; however, exact figures for the materials and labor costs involved in its construction are not available.

The double intersection (or quadrangular) Warren through truss bridge across the Wishkah River was constructed from materials supplied by the Carnegie Steel Company, and its wooden approach trestle and decking materials were undoubtedly supplied by one of the many sawmills located in Grays Harbor County. The 120 foot truss consists of 6 riveted steel, 20 foot long panels and is supported by two concrete piers. (See Profile on

[1]Edwin Van Syckle, The River Pioneers, ed. David Jones (Seattle: Pacific Search Press, 1982), pp. 192-201

[2]Edwin Van Syckle, They Tried to Cut It All (Seattle: Friends of the Aberdeen Public Library [printed by Craftsman Press], 1980), Appendix C, p. 272

Sheet One of the original Design Plan, photograph No. 16). The truss has a clear width of 14'-4" and a vertical clearance of 14'-6". The southernmost pier was adjoined by a 190 foot, wooden, 9-span approach trestle. Together, the original truss and trestle construction measured a total of 310 feet. Over the years, however, the original 9-span approach trestle has been gradually reduced to a single span.[3]

A County work order written in 1922 indicated that the approach trestle was 165 feet in length. This foreshortening of the bridge approach trestle by 25 feet within seven years of the original construction date, reveals that the approach trestle was probably made of untreated timber and that the rainy climate of Grays Harbor County was exacting a heavy toll on the trestle members. Twelve years later, in 1934, the West Wishkah Road was realigned just south of the bridge (see photograph No. 12 & 13). A sharp horseshoe bend in the road and a portion of the trestle inside the project limits were removed. In addition, the remaining spans of the approach trestle were realigned in order to conform to the new road alignment. Thus, the approach spans had been reduced to an overall length of 70 feet. Thereafter, the wooden approach trestle was gradually shortened again and again, with each span removed being replaced by road embankment, until today there remains just a single, 11 foot long, wooden approach span and the steel bridge truss span. The overall length of the present structure is 131 feet.

Except for a curious episode that occurred in 1968, the West Wishkah Bridge has quietly served the inhabitants of the Greenwood area as an important link in the transportation network of Grays Harbor County: it is their only means of public access to the County road system. However, in the wee morning hours of July 4, 1968, some unknown person(s) - supposed celebrant(s) of the nation's birthday - apparently wedged a small charge of blasting powder between two of the diagonal cross members of the bridge and scampered away ahead of the explosion, which resulted in minor damages to the steel truss.[4] Today, a pair of damage-repair gusset plates (see photograph No. 9) and a slight bend in the damaged members on the upstream (eastern) side of the truss attest to that lone act of vandalism on a bridge which has endured over 70 July 4th's and outlasted 13 presidents.

The details of the 120 foot span double intersection Warren through truss West Wishkah Bridge are as follows: The upper chord main members are made of two channels held together by a top plate, and lattice work is riveted to the channels. The minor members are comprised of angles. The lower chords consist of two angles held together by riveted batten plates

[3]This concise description of the West Wishkah Bridge truss owes much to Mile S. Ketchum, The Design of Highway Bridges (New York: Engineering News Publishing Co., 1908), pp. 5, 216

[4]"Blast Weakens Bridge," Aberdeen World [Aberdeen, WA], July 4, 1968

and gusset plates (see photograph No. 10). The floor beams consist of rolled "I" beams and are riveted to the lower chords (see photograph No. 6). Bridge deck stringers are carried directly on top of the floor beams. The upper chords handle the compression loads and the lower chords, the tension loads on the bridge. Lateral struts and braces on the upper chord overhead (see photograph No. 8) and the floor beams and lateral braces on the lower chord below the deck (see photograph No. 6) maintain a fixed separation between the two sides of the truss and stiffen it against transverse stresses placed on it due to wind action.[5]

Generally, a steel truss span should consist of members so arranged that each one is subjected only to stress in the direction of its length. The elementary figures in the span should be triangles. In a simple truss bridge, the upper chord is normally in compression; the lower chord, in tension. Two parallel trusses are usually used to support a bridge deck or roadway. It is the vertical members placed diagonally in double intersection, or quadrangular patterns, however, which provide the double intersection Warren truss with its distinctive and historic feature. The vertical members, so arranged, carry both tension and compression loads; whereas in most other truss types, vertical truss members are designed to handle either tension or compression forces -- but not both. The quadrangular Warren truss, therefore, is a unique design among the various types of bridge trusses in that the stresses applied to its vertical members are statically indeterminate

The Warren Truss Bridge design was named after a British engineer, but it actually antedates the Covered Bridge design and can be traced to structural designs in American and European barns and mills of the 18th Century. The Warren Truss configuration was first applied to bridge building and patented in 1838 by James Warren and Theobad Willoughby Monzani.[6] The original Warren configuration is identified by its "W" shape as depicted in early truss bridge drawings, later in photographs of bridge trusses.[7] In 1867, Robert W. Smith of Ohio made the last important effort to improve upon the Warren design when he patented the Quadrangular Warren Truss design.[8] It consisted of diagonal truss members arranged in a "W" and "M" pattern super imposed upon one another to form the quadrangular pattern reminiscent of the lacing of a boot: "XXXX". In general, the Pratt and Howe Truss designs were favored for long highway and railway bridge spans (170'-240') while the Warren and Quadrangular Warren designs were used in spans of short to moderate length (80'-170').[9] However, with the advent of low cost concrete bridges in the 1950's, the building of steel truss bridges has been a major decline.

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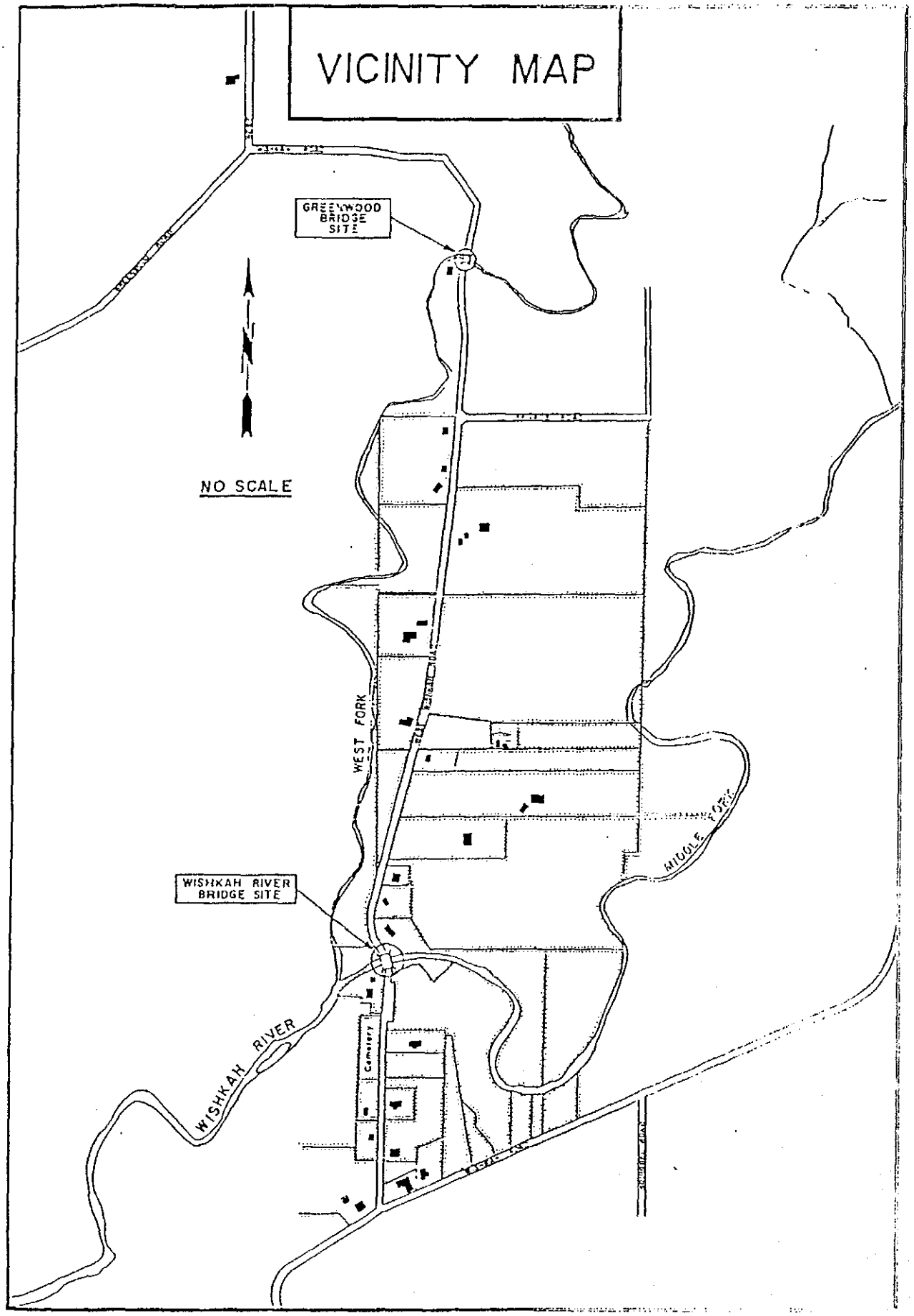
[5]Mansfield Merriman and Henry S. Jacoby, Stresses in Simple Trusses, (6th ed.; New York: John Wiley and Sons, 1906, p. 197

[6]Kramer A. Adams, Covered Bridges of the West (Berkeley, CA:Howell-North Books, 1963), pp 30-31

[7]Ibid. [8]Ibid.

[9]Ketchum, pp. 7-8

The West Wishkah Bridge is soon to be replaced by a double lane concrete bridge. It is important, therefore, that the features of the Quadrangular Warren truss, which represent a unique point in the historical evolution of bridge construction in the United States, be accurately photographed and archived. Such a photographic archive may allow future historians, architects, and engineers a clearer glimpse into their country's industrial past. To that end also has this historical narrative been respectfully prepared.


VICINITY MAP
GREENWOOD BRIDGE SITE
NO SCALE
WEST FORK
MIDDLE FORK
WISHKAH RIVER BRIDGE SITE
WISHKAH RIVER
Cemetery